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ABSTRACT

Formerly reserved for use by scientists, researchers, and computer buffs, computer networks now have capabilities that make them extremely useful to science teachers and their classes. This digest is designed to provide educators with some basic background on computer communications and to provide a few examples of computer networks that are easily available to them and their students. Topics discussed are: (1) the power of communication, (2) the advantages of electronic mail, (3) dealing with networking charges, (4) networks available to science teachers (Science Line, EcoNet, PSINets, Internet/BITNET, and ERIC OnLine), and (5) getting involved in computer networking. (PR)

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Computer Networks for Science Teachers

Kimberly S. Roempler & Charles R. Warren

Computers and the technologies associated with them are major forces in the virtual shrinking of the globe. Through computer networks, students and teachers across the United States and around the world are interacting to share experiences and to investigate local problems in a global context. Formerly reserved for use by scientists, researchers, and computer buffs, computer networks now have capabilities that make them extremely useful to science teachers and their classes.

A network links computers via standard telephone service. Electronic mail (e-mail), data, software, and other messages can be sent and stored to be read sometime later by the receiver. With a modem and a computer, one can "meet" science educators with common interests in almost any area of the country or the world, 24 hours a day. Educators can easily be on the cutting edge of the use of instructional technology through the use of computer networks.

This digest is designed to provide educators some basic background on computer communications and to provide a few examples of computer networks that are easily available to them and their students.

The Power of Communication

Telecommunications can add vitality and excitement to the classroom. Students and educators see subjects come to life as they study topics such as tropical timber resources, environmental crises, or the AIDS pandemic. Through telecommunications, classes can be in contact with individuals and organizations who address these issues on a day-to-day basis.

Science classes can also communicate directly with other science classes around the world to conduct research or explore and share ideas. This kind of across-the-globe networking can be an exciting project for students of all ages. In one recent effort, for example, elementary school students from across the United States measured daily precipitation and the acidity of collected samples of rainwater. This information was shared on a computer network with classes from many parts of the country, and a daily acid rain map was created. Other activities have included on-line science fairs and on-line surveys. Networks have allowed the creation of an exciting "global classroom" both in its content focus and its participation.

The Advantages of Electronic Mail

A common complaint of science teachers is the feeling of isolation from other professionals with similar interests. Computer networks allow teachers to "reach out and touch someone." Teachers can share ideas and activities through the use of electronic bulletin boards. Networks can also serve as resource retrieval databases. Data retrieved from computer networks can be analyzed by students. Computer networking improves communication and data exchange by allowing participation in ongoing computer conferences as well as private e-mail. Increased productivity, creativity, and professional activity are some of the results of using computer networks.

Using a computer network can save communication time and money. One has the freedom and flexibility to use the service in a timely manner—whether it's six in the morning or midnight. Sending correspondence via e-mail can be more productive than trying to get someone over the phone, because mail is held for retrieval until the user logs on.

Dealing With Networking Charges

The costs of networks vary. Startup expenses can include the costs of a computer, modem, software, and user fees. For a long distance network, on-line time can be quite expensive. There are, however, several ways to cut some of the costs. Because the networks can be used at any time, using the service in the evening and on weekends can cut costs considerably. To decrease the time needed on the phone, some networks allow messages to be composed in advance, off-line, and then transmitted electronically. This is called uploading. Uploading results in less time on-line and therefore lower phone charges.

Different terminal systems can also affect costs. Some computer networks use "smart terminal" systems while others use "dumb terminal" systems. A "smart terminal" system, where the microcomputer is pre-programmed to run the network computer, runs quickly and efficiently and results in lower phone line charges. "Dumb terminal" systems require all work to be done on-line and are therefore more costly.

Many teachers do not have time to interact frequently with computer networks while at school. Fortunately, most computer networks are available on a 24-hour basis making this type of communication exceptionally flexible.

Networks Available to Science Teachers

Science Line, EcoNet, PSINets, INTERNET/BITNET, and ERIC OnLine systems are examples of computer networks that have much to offer science educators.

Science Line, a National Science Teacher Association (NSTA) sponsored electronic bulletin board, allows a user to scan and download a variety of science and general interest programs, including public domain and shareware software, the latest information on summer programs and NSTA projects, official information files from government agencies and organizations, text on computer techniques and scientific papers on topics like cold fusion, teacher aids such as gradebook programs, and interesting classroom demonstrations.

EcoNet is an international computer network related to the environment and education. EcoNet serves environmental educators as part of its broad mission to provide information services to the international environmental community. As a central program of the Institute for Global Communications (IGC), EcoNet allows users to send messages to

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another continent, gather the latest information on a wide variety of environmental topics, interact with other members of the environmental community around the world, look for a job in the environmental field, or find a foundation that might fund a project. Both *Science Line* and EcoNet require on-line time because they are "dumb terminal" systems.

PSINets, initiated in 1985, are People Sharing Information Networks. Different PSINets have been established in various states (e.g., Iowa, Georgia, and Ohio) with the cooperation of IBM and the Council of State Science Supervisors (CSSS). Typical conferences currently available on these networks include: (1) curriculum materials, (2) announcements, (3) forums, (3) surveys, (4) projects, (5) phonebooks, and (6) activities for students.

At the state level, PSINets have found great success. In 1991, for example, every school district in Ohio was offered inservice training on the use of PSINet networks, and more than half received the necessary software to use OHNet (the Ohio PSINet). A toll free number was established by the Science Education Council of Ohio and the Ohio Department of Education. This number has allowed science teachers and administrators to access the network without telephone charges. Through OHNet, Ohio teachers are informed about local, state, and national science education resources, trends, and curriculum developments.

PSINets are networked to national PSINets such as the National STS network, the Council of State Science Supervisors PSINet, and PSINets in other states. Communication between sites across the country and around the world is made possible through this network of networks. Many states are operating PSINets at this time.

PSINets are examples of "smart terminal" systems. PSINet uses a unique IBM software package that allows a user to run the network server computer from one's own microcomputer with greatly decreased on-line time. Typical daily phone calls between the user and the server last less than two minutes. Plans for the growth of PSINet involve a software version for Macintosh computers and a link to INTERNET.

INTERNET and BITNET are academic computing networks that are becoming available to teachers in some areas. The computer network in the state of Texas links hundreds of teachers through an INTERNET system. Commonly accessed through local universities, BITNET/INTERNET systems can be interfaced through the use of several different software packages. These systems have many international connections and can link a user with a variety of resources such as databases, library holdings, and other networks.

SUNINFO, a campus information system at Syracuse University that uses the SPIRES/*PRISM* interface, allows INTERNET users to access the last five years of the ERIC Database. A full-text file of over 850 ERIC digests is also available to INTERNET users through the Extended Bulletin Board of the Office for Information Technology, University of North Carolina at Chapel Hill. For more information about these and other ERIC OnLine systems, contact ACCESS ERIC: 1-800-LET-ERIC.

Getting Involved

The computer networks mentioned in this digest are only the tip of the iceberg. There are hundreds of local, regional, national, and international computer networks. Most computer networks can set up an account and a password over the telephone. Research and history involving networks tell us that successful networks share three things: (1) involved users on the system; (2) active paper mail support; and (3) occasional face-to-face meetings between users. Networking will expand educators' horizons on both the personal and professional level.

For more information, contact:

Science Line
National Science Teachers Association
1742 Connecticut Ave. NW
Washington, DC 20009
(202) 328-5853

EcoNet
Institute for Global Communications
3228 Sacramento Street
San Francisco, California 94115
(415) 923-0900
(415) 923-1665 (FAX)
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PSINet
Contact your state science or mathematics consultant at your respective department of education or:
Jack Gerlovich
National Director PSINet
Center for Teacher Education
Drake University
Des Moines, IA 50311
(515) 271-3912

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